University of Bahrain
College of Information technology
Department of Computer Engineering

Test (2)

Student Name	
I.D. No.	
Section	

Solution

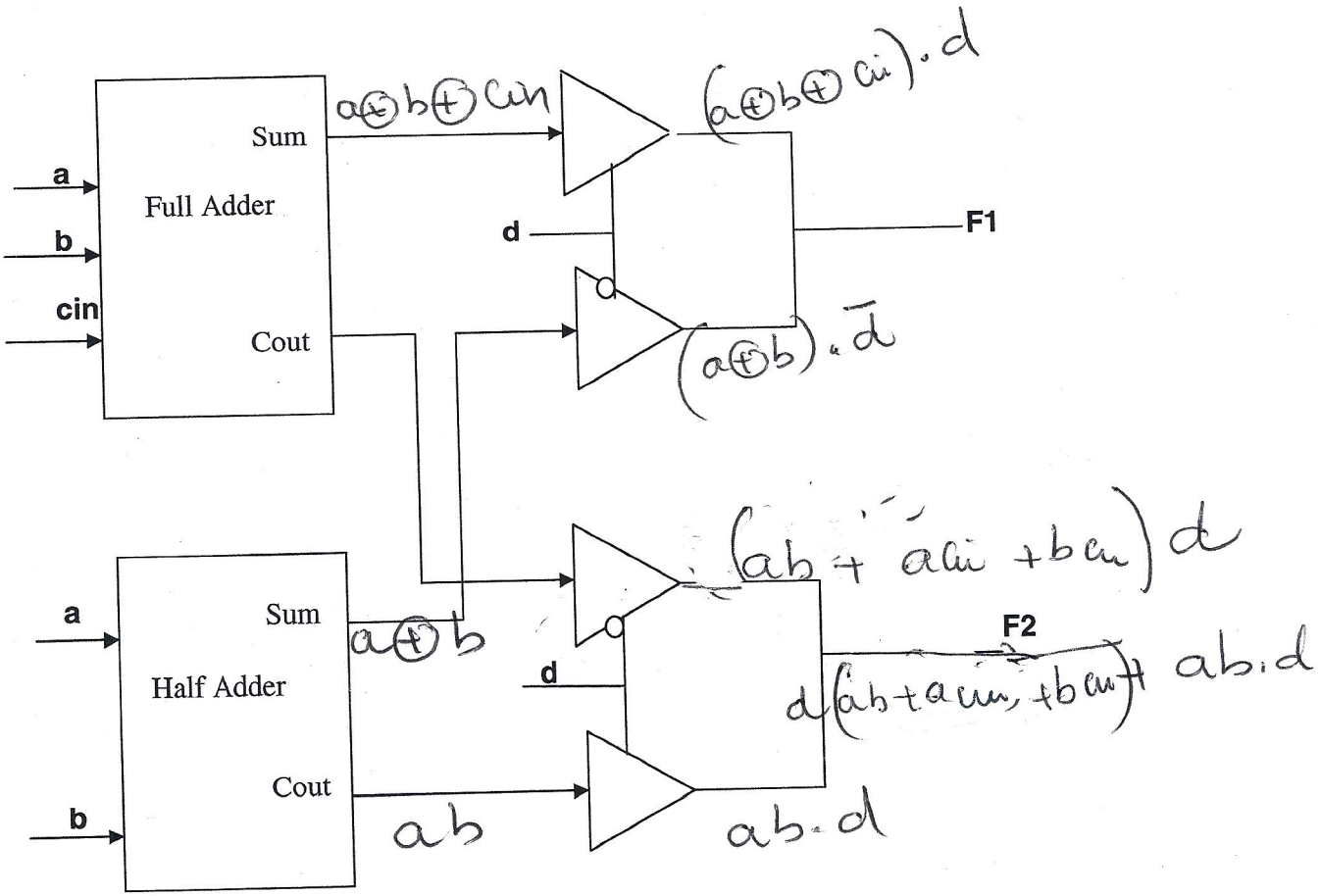
Course Title: Digital Logic
Course number: ITCE 202/250
Semester: 1
Academic Year: 2012/2013
Duration : 1 hour
Date: 14th Mai 2013

Read the following before you start:
1. Write your name, ID and section number
2. Answer all questions.
3. Write your answers on the attached sheets only.

Question	Mark	Mark attained
1	12	
2	12	
3	12	
4	12	
5	12	
Total	60	

Question [1]: [12 mark]

Write the equations of the functions F1 and F2 generated by the following circuit.

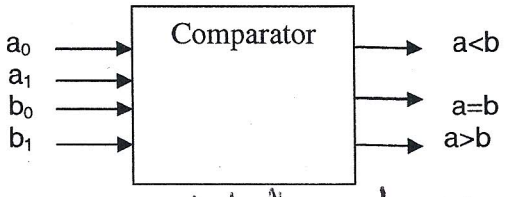


$F_1 = (a \oplus b \oplus c_{in}) \cdot d + (a \oplus b) \cdot \bar{d}$

$F_2 = (ab + a c_{in} + b c_{in}) d + a \cdot b \cdot d$

Question [2] : [12 marks]

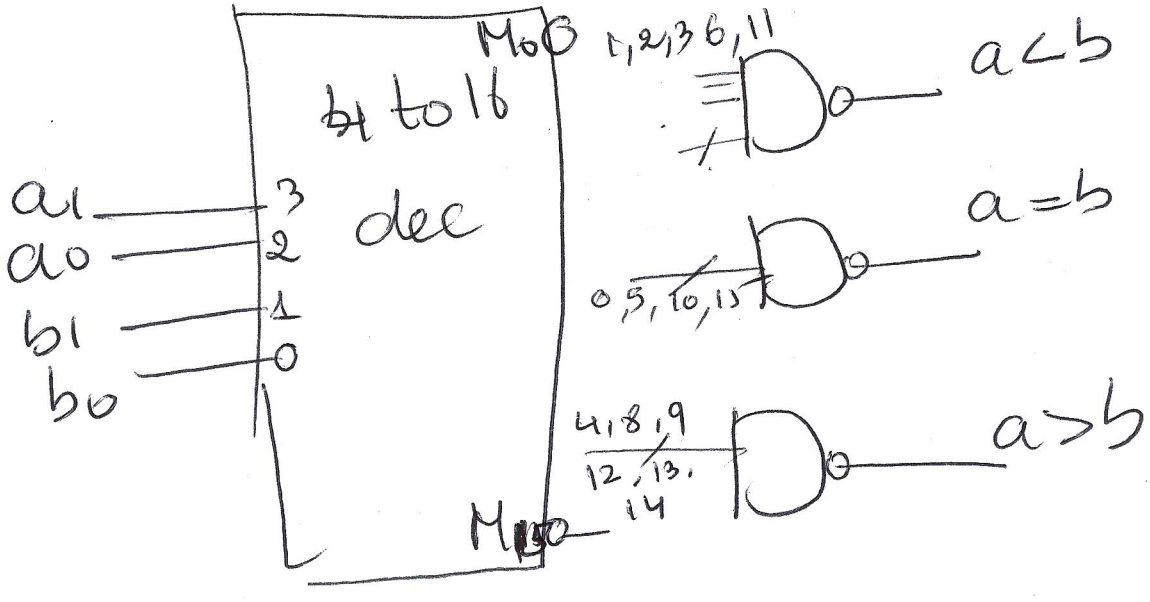
We want to design a 2-bit word comparator that compares the word $a= a_0 a_1$ with the word $b= b_0 b_1$.



1)Give the truth table of the comparator.

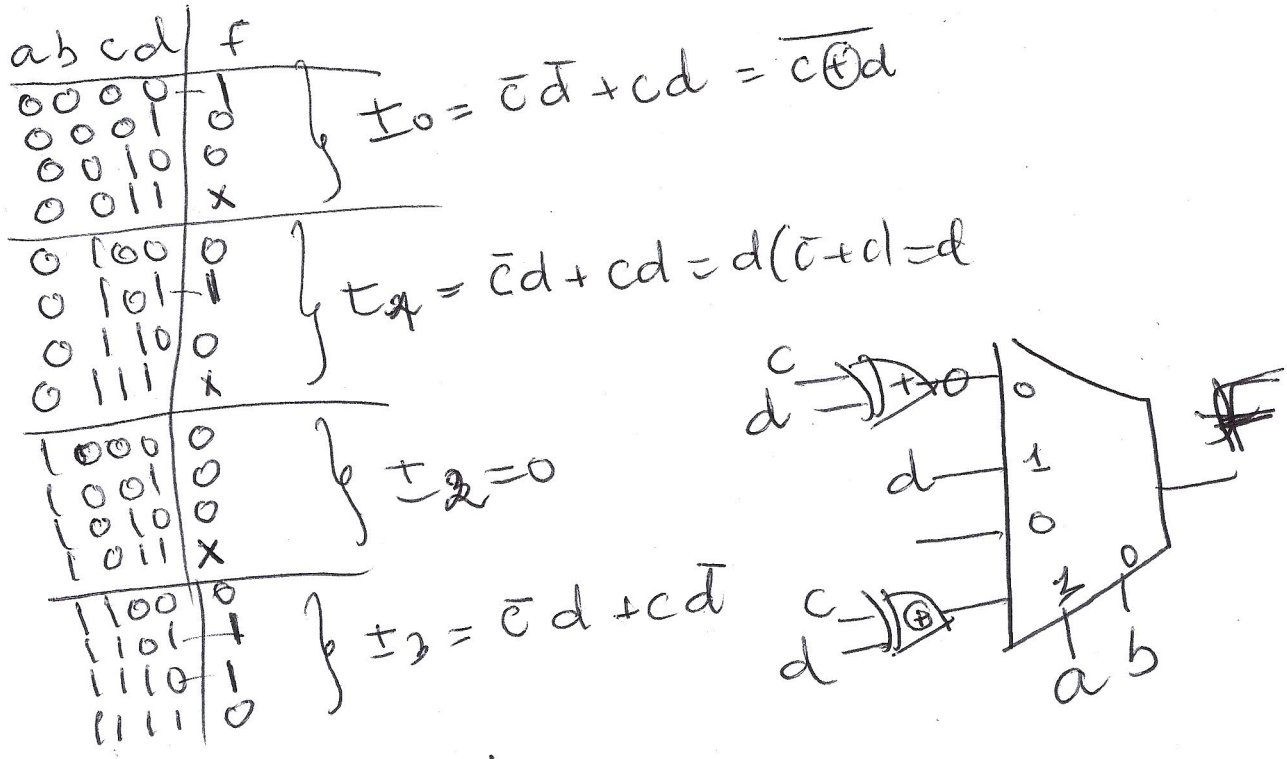
a_1	a_0	b_1	b_0	a<b	a=b	a>b
0	0	0	0	0	1	0
0	0	0	1	1	0	0
0	0	1	0	1	0	0
0	0	1	1	1	0	0
0	1	0	0	0	0	1
0	1	0	1	0	1	0
0	1	1	0	1	0	0
0	1	1	1	1	0	0
1	0	0	0	0	0	1
1	0	0	1	0	0	1
1	0	1	0	0	1	0
1	0	1	1	1	0	0
1	1	0	0	0	0	1
1	1	0	1	0	0	1
1	1	1	0	0	0	1
1	1	1	1	0	1	0

2) Implement the comparator with a decoder with inverted outputs and only NAND gates.

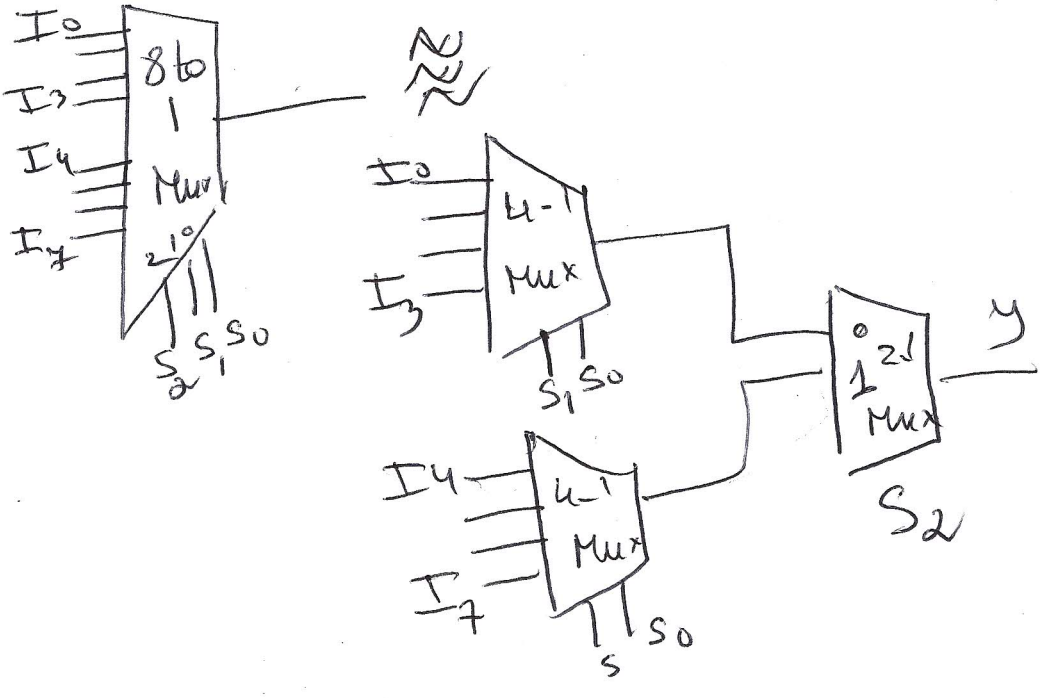


Question [3]: [12 marks]

a. Implement F= Σm(0,5,13,14) + Σd(3,7,11) with a 4 to 1 Multiplexer and a minimum number of gates.



b- Show how to make an 8 to 1 Mux by using a number of 4-to-1 Muxs and one 2-to-1 Mux.



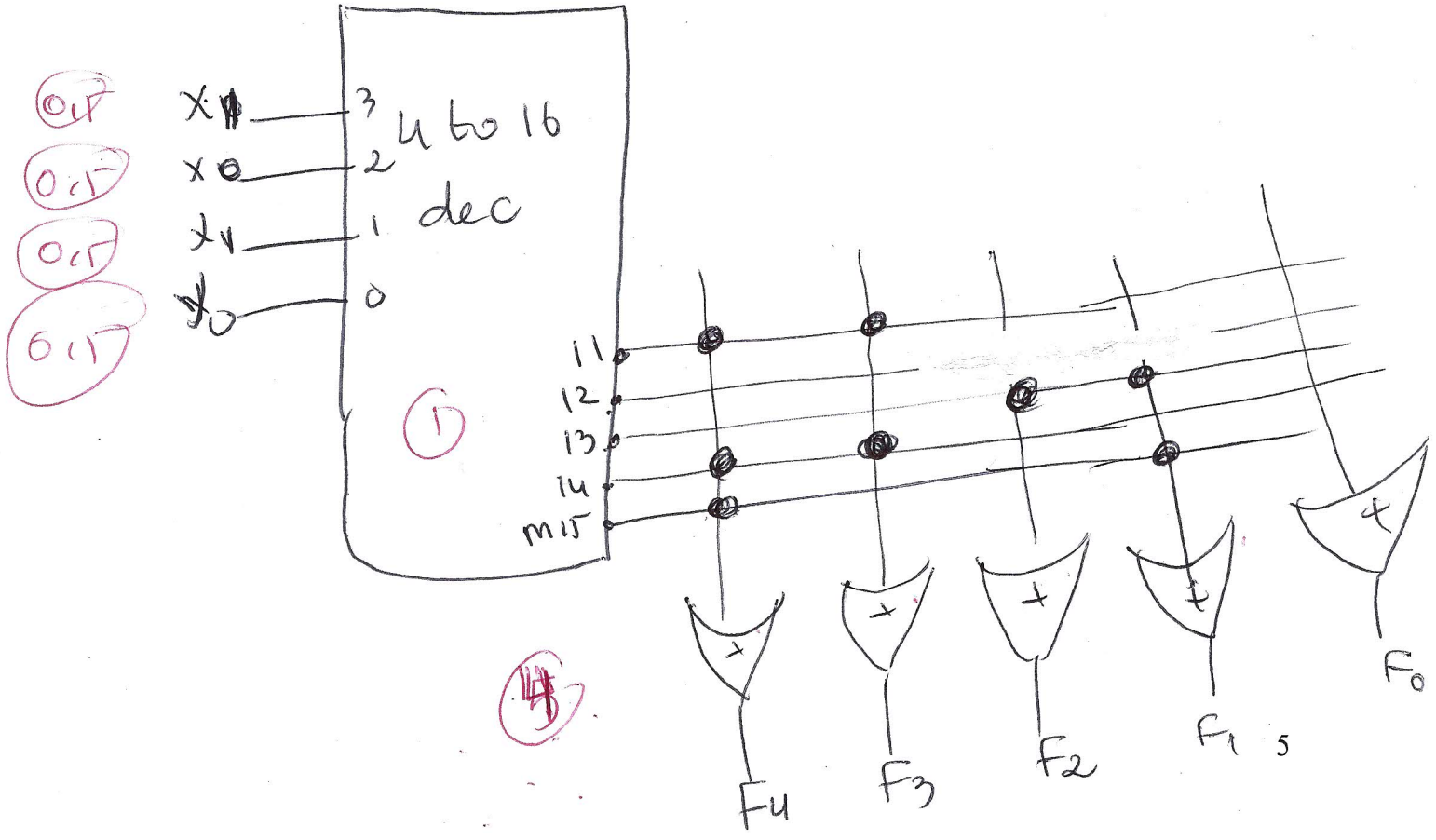
Question [4]: [12 mark]

a. Construct the truth table of a ROM to implement the function F= 2 X Y. Where X and Y are 2-bit binary numbers.

X_1X_0	Y_1Y_0	$F_4F_3F_2F_1F_0$
00	00	00000
00	01	00000
00	10	00000
00	11	00000
01	00	00000
01	01	00010
01	10	00100
01	11	00110
10	00	00000
10	01	00100
10	10	01000
10	11	01100
11	00	00000
11	01	00110
11	10	01100
11	11	10010

5

b. Draw the internal structure of the ROM showing only the last 5 memory lines (words).



5

Question [5]: [12 mark]

a) Derive the next state (characteristic) equation for T- Flip-Flop.

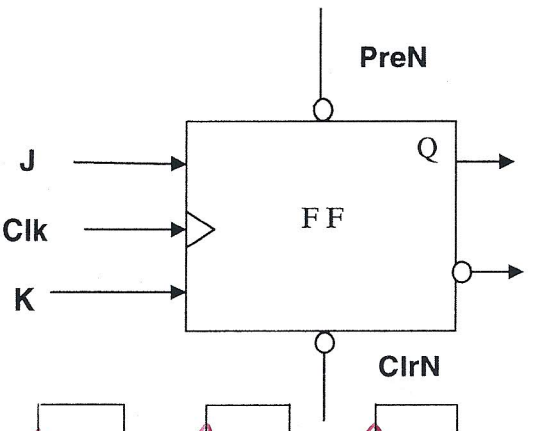
T	Q	Q^+
0	0	0
0	1	1
1	0	1
1	1	0

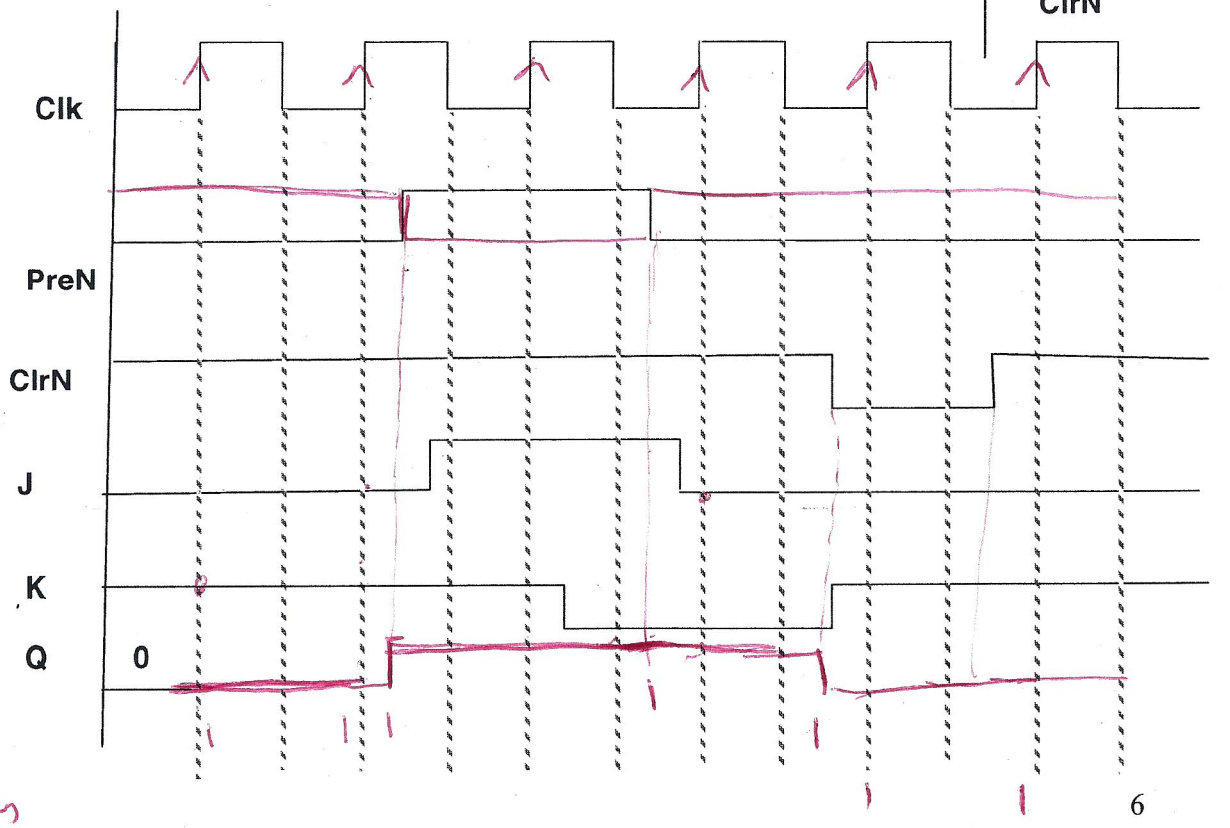
$Q^+ = T \oplus Q$

(4)

(4)

b) Complete the following timing diagram for the following J-K Flip Flop.





J	K	Q^+
0	0	no change
0	1	0
1	0	1
1	1	$\bar{Q}$

(8)